

RECTIMARGINALIS, NEW GENUS, WITH KEY TO GENERA OF HOLOCHLORINI (ORTHOPTERA: TETTIGONIIDAE: PHANEROPTERINAE) FROM CHINA¹

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ABSTRACT: A new genus, *Rectimarginalis* is erected for *Holochlora fuscospinosa*, *H. traba*, *H. ensis* comb. nov. and *Rectimarginalis profunda* sp. nov., based on the distinguished male stridulatory apparatus and male epiproct with possession of a stick-shaped projection. The new genus belongs to the tribe Holochlorini. A key to the eleven Chinese genera of Holochlorini is provided. A new species, *R. profunda*, is described from southwestern China. Two more new combinations, *R. ensis* (De Haan), and *R. traba* (Ingrisch), are proposed. A key to all four species of *Rectimarginalis* is given, together with illustrations of important taxonomic characters.

KEY WORDS: new genus, new species, Holochlorini, key, stridulatory area, China, Orthoptera, Phaneropterinae

Due to special functions of sound in mating behavior of Orthopteroid insects, Characters of the male stridulatory organ play an important role in separation for species and genera (Liu et al, 2004). When examining the tettigoniids from several museum collections, we established a new genus *Rectimarginalis*, for 3 known species, *Holochlora fuscospinosa* Brunner von Wattenwyl, *Holochlora ensis* (De Haan), *Holochlora traba* Ingrisch and Shishodia, and one new species *R. profunda*, based on specialized male stridulatory area and epiproct.

The genus *Holochlora* Stål is an important group of the subfamily Phaneropterinae, and is mainly distributed in the Oriental region. Fifty-eight species were recorded in the genus *Holochlora* Stål (Eades et al, 2006), among which some of the species are not monophyletic. The genus *Sinochlora* was established by Tinkham (1945) for the type species *Sinochlora kwangtungensis*, which was a synonym of *Sinochlora longifissa* (Matsumura and Shiraki, 1908), based on the recent studies (Kang, 1987; Liu and Jin, 1999). In fact the genus *Sinochlora* has covered 13 species, among which one species *Sinochlora voluptaria* (Carl) was also removed out of *Holochlora* (Liu and Kang, 2007). Our current investigation proposed to transfer 3 known species, *Holochlora fuscospinosa* Brunner von Wattenwyl, *Holochlora ensis* (De Haan), *Holochlora traba* Ingrisch and Shishodia, from the genus *Holochlora*, and to establish the new genus *Rectimarginalis*.

The new genus is related to *Sinochlora*, *Pseudopsyra*, and *Holochlora*, but maybe it is more remotely related to *Holochlora* than *Sinochlora* and *Pseudopsyra*. It is distinctly distinguished from *Holochlora* and other related genera including *Sinochlora* Tinkham, and *Pseudopsyra* Hebard by the following synapomorphies: field around stridulatory file is not swollen (Figs. 6, 8), and, posterior portion of anal margin of right stridulatory area is straight (Figs. 7, 9).

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Whereas, the species of the genera *Holochlora*, *Sinochlora*, and *Pseudopsyra* possess similar characteristics about male stridulatory area with the field around stridulatory file being strongly swollen (Figs. 10, 12, 14), and base of the posterior portion of anal margin of right stridulatory area being concave into a triangular region with other veinlets (Figs. 11, 13, 15). Furthermore, apical projection of male epiproct of the new genus is stick-shaped (Figs. 22-25), as male phallus described by Ingrisich and Shishodia (1998; 2000).

The new genus belongs to the tribe Holochlorini. Holochlorini is erected by Bei-Bienko (1954), who provided descriptions restricted to some genera reaching countries adjacent to U.S.S.R, and did not include all genera of Holochlorini. Eades et al (2006) included nine genera in Holochlorini, and we proposed that the genera *Parapsyra* Carl, *Pseudopsyra* Hebard, *Sinochlora* Tinkham, and *Stictophaula* Hebard are ascribed to the tribe. Here we just provided a key to the eleven genera of Holochlorini in China in order to compare the new genus with other relatives.

Materials come from the following two depositories: Insect Collection of Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZAS); and Institute of Entomology, Chinese Academy of Sciences, Shanghai, China (MSIE).

Key to Chinese genera of the tribe Holochlorini

1. Genicular lobe of hind femur with 1-2 spines.....2
 Genicular lobe of hind femur rounded, without spines.....10
2. Male subgenital plate without styli. Female ovipositor with lateral surface smooth3
 Male subgenital plate with styli. Female ovipositor with lateral surface more or less granulated5
3. Tegmina with Rs not bifurcated. Male tenth abdominal tergum with median process prolonged*Phaulula* Bolívar, 1906
 Tegmina with Rs bifurcated. Male tenth abdominal tergum without median process4
4. Posterior margin of pronotum with a small median notch. Leg pilose. Male subgenital plate emarginated*Arnobia* Stål, 1876
 Posterior margin of pronotum without median notch. Leg not pilose. Male subgenital plate with apical margin deeply notched
 *Stictophaula* Hebard, 1922
5. Tegmen usually with delicate texture, more or less sub-transparent. Female ovipositor thickset, somewhat coarse; dorsal margin obliquely truncated or with a slight truncation at apex6
 Tegmen usually with slightly coarse texture. Female ovipositor fine, compressed, gradually curved8
6. Left stridulatory vein not swollen on dorsal side of tegmen (Figs. 6, 8); stridulatory file on underside of left tegmen fine (Figs. 1-2). Male epiproct

- with the possession of a stick-shaped projection (Figs. 22-25)
*Rectimarginalis* NEW GENUS
 Left stridulatory vein strongly swollen on dorsal side of tegmen (Figs. 10, 12); stridulatory file on underside of left tegmen rather thick (Figs. 3-4). Male epiproct not same as above7
7. Costal vein black and white at base of tegmen. Femoral spines strongly black. Male tenth abdominal tergum with a pair of forcipate processes and a median process, which varied through different species. Female ovipositor with the dorsal valvulae strongly truncate at apex
*Sinochlora* Tinkham, 1945
 Costal vein always concolorous with rest of tegmen. Femoral spines not black except in *Holochlora venusta* Carl. Male tenth abdominal tergum with a pair of knob-like processes. Female ovipositor with the dorsal valvulae slightly obliquely truncated at apex*Holochlora* Stål, 1873
8. Tegmina with costal vein indistinct*Parapsyra* Carl, 1914
 Tegmina with costal vein distinct9
9. Male tenth abdominal tergum not produced into a strongly deflexed plate; male subgenital plate with styli much shorter than half of its length
*Psyrana* Uvarov, 1940
 Male tenth abdominal tergum produced into a strongly deflexed large plate; male subgenital plate with styli much longer than its length
*Pseudopsyra* Hebard, 1922
10. Pronotal disc with lateral margins parallel. Occiput and pronotum punctured. Male subgenital plate with styli longer than its length. Female ovipositor with lateral surface smooth*Tapiena* Bolívar, 1906
 Pronotal disc with lateral margins spreading outwards; occiput and pronotum not punctured. Male subgenital plate with styli much shorter than third of its length. Female ovipositor with distal part of lateral surface granulated
*Ruidocollaris* Liu, 1993

Rectimarginalis NEW GENUS

Type species: *Holochlora fuscospinosa* Brunner von Wattenwyl, 1891

Diagnosis: Size medium or large. Parapterous, usually green, rarely colourful. Male left stridulatory vein swelling on dorsal surface of tegmen (Figs. 6, 8). Stridulatory file on underside of left tegmen fine. Mirror of right tegmen indistinct, occupied by several veinlets (Figs. 7, 9). Male tenth abdominal tergum divided into two lateral lobes (Figs. 16-17, 19-20). Epiproct with a stick-shaped projection (Figs. 22-25). Male subgenital plate with short styli (Figs. 18, 21). Female ovipositor robust, with dorsal margin of distal part only slightly truncate (Fig. 26).

Description: Occiput slightly convex. Fastigium verticis circa right-angularly inserted with fastigium frontis, dorsally and distally sulcate, narrower than first segment of the antennae. Compound eyes wide, oval, brown. Antennae long, thin.

Pronotal disc smooth, with longitudinal carina subtle in prozona and distinct in metazona, without lateral carina; main sulcus V-shaped; anterior margin slightly concave, posterior margin convex. Paranota distinctly higher than long; anterior margin substraight to slightly concave, ventral margin oblique, posterior margin S-shaped; humeral notch distinct. Tegmina and wings fully developed. Tegmen gradually widened toward the middle, and then gradually narrowed toward the apex; greatest width of tegmen longer than the length of pronotum, tegminal apex narrowly rounded; costal vein distinct straight and short; Rs generally bifurcate; cross-veins of tegmina numerous, many of which straight and transverse.

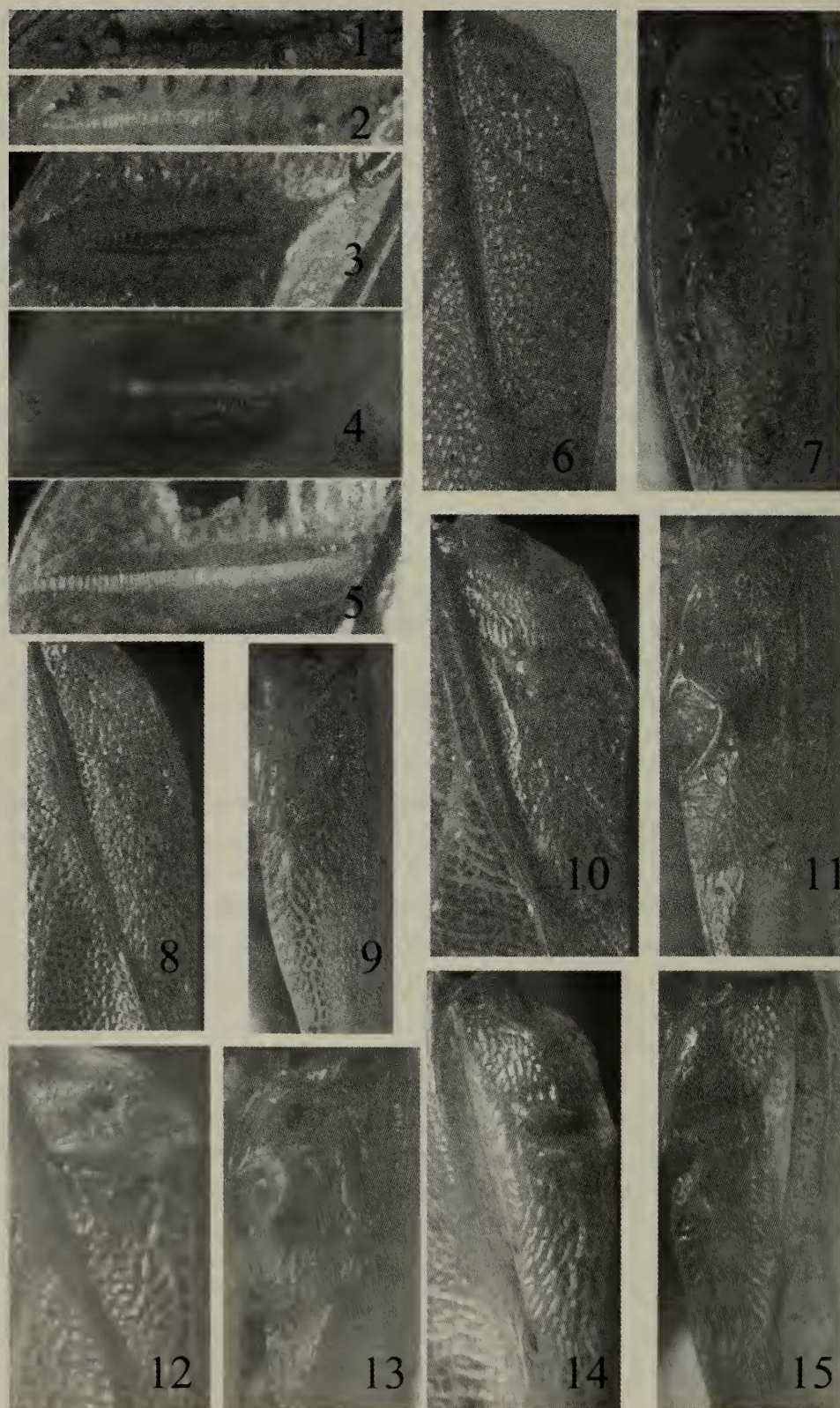
Anterior coxae armed. Anterior tibiae dorsally sulcate, widened at and suddenly constricted below tympana; auditory foramina internally conchate, externally apert. The occurrence and number of small spinules on femora and tibiae is not constant, it may even vary between both sides of the same individual. The following pattern occurs most commonly: anterior femora with spinules on ventro-internal, median femora on ventro-external, and posterior femora on both ventral margins. Anterior tibiae with spinules on dorso-external, median tibiae on dorso-internal, and posterior tibiae on both dorsal margins. Genicular lobe with two spines on each femur.

Male: Epiproct stick-shaped, covered with clinging hairs. Subgenital plate elongate, split at apex, with short styli.

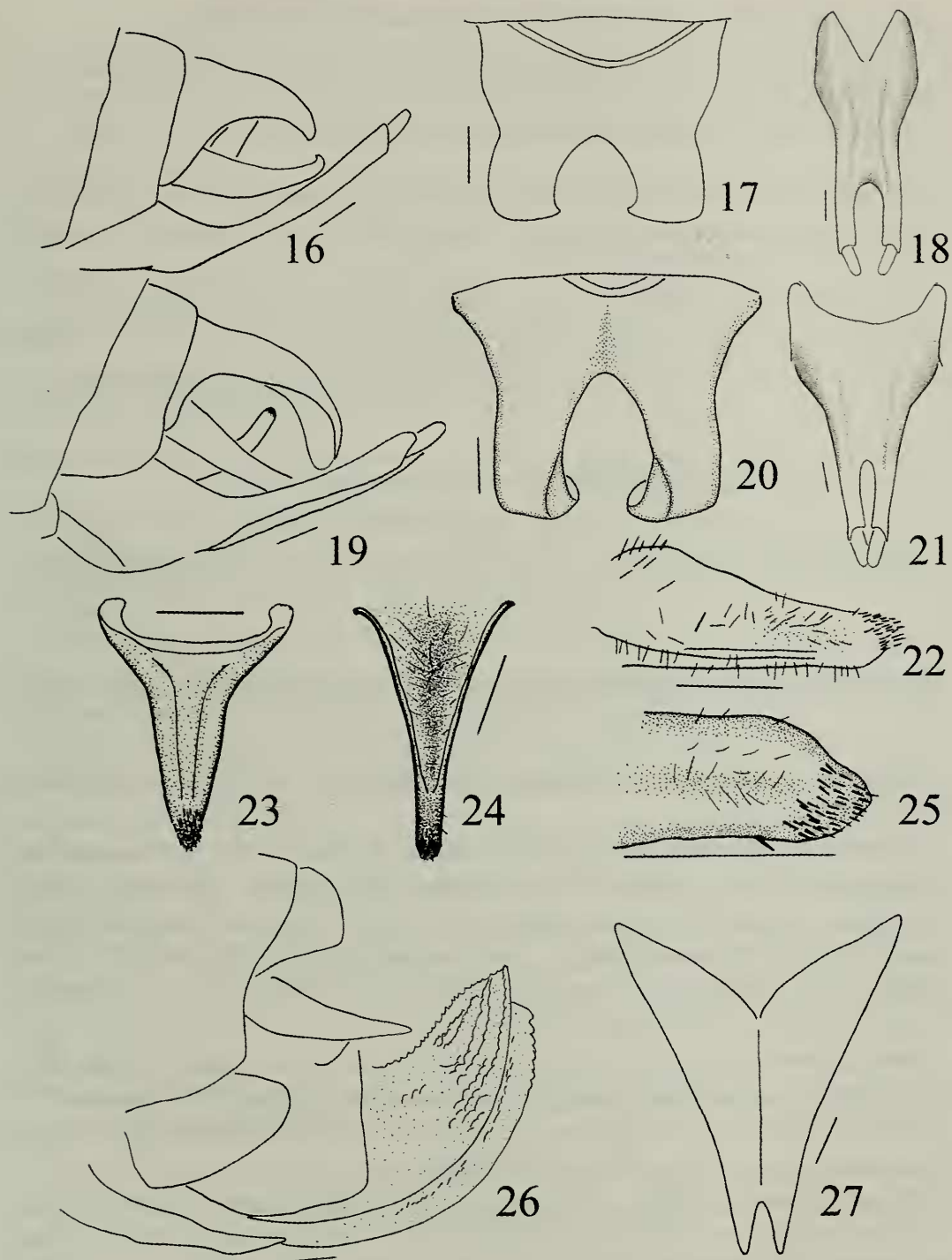
Female: Similar to *Holochlora* Stål. Size distinctly larger than male. Tenth abdominal tergum with apical margin emarginated. Cerci rather short, conical. Ovipositor robust with distinct transverse ridgy pleat, lateral surface coarse with rows of irregular spines in the distal half, dorsal margin serrate with distal part obliquely truncated, ventral margin with distal sixth denticulate (Fig. 26).

Discussion: The new genus belongs to *Holochlorini*, for characters as *fastigium frontis*, *fastigium verticis*, *occiput*, *pronotum*, *tegmen*, *anterior tibial tympana*, *spination of legs*. The differences from other Chinese genera in *Holochlorini* are listed in the above key.

Etymology: The name *Rectimarginalis* is composed of the prefix *Recti-*, meaning straight, and the word *marginal*. The name refers to the distinctively straight posterior margin of the male right stridulatory area which differs from the situation in other genera of *Holochlorini*. The name is regarded as feminine in gender.



Figs. 1-15. Male stridulatory area 1, 6-7. *Rectimarginalis fuscospinosa*; 2, 8-9. *R. profunda*; 3, 10-11. *Holochlora* sp.; 4, 12-13. *Sinochlora* sp.; 5, 14-15. *Pseudopsyra* sp. 1-5. Male stridulatory file underside of the left tegmen; 6, 8, 10, 12, 14. Male stridulatory area of left tegmen; 7, 9, 11, 13, 15. Male stridulatory area of right tegmen.



Figs. 16-27. Species of *Rectimarginalis*. Figs. 16-18, 22-27. *R. fuscospinosa*; Figs. 19-21. *R. profunda*. 16, 19. Male abdominal apex, lateral view; 17, 20. Male tenth abdominal tergum, dorsal view; 18, 21. Male subgenital plate, ventral view; 23. Male epiproct, dorsal view; 24. Male epiproct, ventral view; 21. Male epiproct, lateral view; 25. Male epiproct, lateral-apical view 26. Female abdominal apex, lateral view; 27. Female subgenital plate, ventral view.

Key to species of *Rectimarginalis* NEW GENUS

1. Each lateral margin of occiput with a short brown line behind compound eye, extending along pronotal lateral margin.....2
Occiput and pronotum with unicolorous dorsal surface.....3
2. Tegmen with cells in radial and medial areas with aggregation of brown dots. Male tenth abdominal tergum split in distal half; lateral lobes short, strongly narrowed at apex (Figs. 16-17).....
...*Rectimarginalis fuscospinosa* (Brunner von Wattenwyl, 1891) comb. nov.
Tegmen unicolorous. Male tenth abdominal tergum split in basal third; lateral lobe long, gradually narrowed distad (Figs. 19-21)
.....*Rectimarginalis profunda* NEW SPECIES
3. Male subgenital plate split in distal quarter into two compressed lobes (Ingrisch and Shishodia 1998: 372, Fig. 27)
.....*Rectimarginalis traba* (Ingrisch and Shishodia, 1998) comb. nov.
Male subgenital plate split in distal third into two cylindrical lobes (Karny 1926: 121, Fig. 138)*Rectimarginalis ensis* (De Haan, 1842) comb. nov.

***Rectimarginalis fuscospinosa* (Brunner von Wattenwyl, 1891) comb. nov.**
(Figs. 1, 2, 6-9, 16-18, 22-27)

Holochlora fuscospinosa Brunner von Wattenwyl, 1891: 91, 92; Hebard, 1922: 158.

Examined material: 1 male, P.R. China: Yunnan Prov.: Xishuangbanna, Mengla, 620-650m, 1958.XI.15, Coll. Zhang Yiran (IZAS). Paratype: 1 male, P.R. China: Hainan Island, Jianfengling, 1983.VIII.4, Coll. Liu Yuanrun (IZAS); 1 male, Tonkin, Hoa-Binh, leg. A. de Cooman (IZAS); 1 female, P.R. China: Yunnan Prov., Mengyang, Sanchahe, 1995.VII.31-VIII.3, Coll. Liu Xianwei, Zhang Weinian and Jin Xingbao (MSIE).

Description: Male. Medium-sized. Hind wings longer than tegmina. Tegmina distinctly surpassing beyond the genicular lobe of hind femur; Tegmen with costal vein edged by a brown line, Rs branching slightly before middle of tegmen; radial stem with 3 more lateral branches.

Male: Stridulatory file on underside of left tegmen in basal part with about 9 indistinct small teeth, middle part with about 23 widely arranged large teeth, and distal part with 8 obsolescent teeth (Fig. 1). Tenth abdominal tergum dorsally with an obtuse furrow in the basal third. Lateral lobes strongly deviating outwards; notch "U"-shaped (Figs. 16-17). Epiproct beam-shaped, upheaved lengthwise in center, shaped a median groove in the ventral surface, with numerous brown bristles at apex (Figs. 22-25). Cerci rather long, extending little beyond three quarters of subgenital plate, coniform, evenly incurved, apex with an incurved hook. Subgenital plate widest at base, evenly constricted in basal

third, split in apical third into two lobes; styli short, cylindrical; ventral surface of subgenital plate with two lateral and one median carina (Fig. 18).

Female: Subgenital plate narrowly triangular, longer than wide, lateral margin slightly concave, apex with acute triangular notch (Fig. 27).

Coloration: Green brownish (discolored probably green when alive). Both lateral margins of pronotal disc with dark brown longitudinal stripes. Each lateral lobe of pronotum with two brown spots. Area between radial and cubital veins of tegmen with large brown spots. Hook of cercus dark brown.

Measurements (mm): length of body: male 26.0, female 36.0; length of pronotum: male 7.5, female 8.5; length of tegmen: male 51.0, female 62.5; greatest width of tegmen: male 12.5, female 18.0; length of hind wing: male 57.0, female 67.5; length of hind femur: male 28.5, female 33.5; length of ovipositor 8.0.

Rectimarginalis profunda NEW SPECIES

(Figs. 2, 8-9, 19-21)

Type Material: Holotype. 1 male, P.R. China: Yunnan Prov.: Xishuanbanna, Mengnuo, 850m, 1957.VI.27, Coll. Li Xiaofu (IZAS).

Description: Male (holotype). Large-sized. Tegmen with costa bordered by a brown line; Rs branching before middle of the tegmen; radial stem with also three more lateral branches.

Male: Stridulatory file on underside of left tegmen in basal 2/3 with about 25 widely arranged large teeth, and distal part with about 7 obsolescent teeth (Fig. 2). Tenth abdominal tergum long, arcuately deflexed in distal half, with lateral margin concave; split in basal third into two lobes with internal semilunar groove in distal part (Figs. 19-20). Cerci rather long, extending as far as two thirds of subgenital plate, coniform, evenly incurved, apex with an incurved hook. Subgenital plate widest at base, gradually tapering and more strongly tapering behind basal third, split in apical third into two thin sheet lobes; styli short, cylindrical (Fig. 21).

Female: Unknown.

Coloration: Green. Lateral margins of pronotal disc with symmetrical light brown longitudinal stripes.

Measurements of male (mm): length of body 26.0, length of pronotum 6.0, length of tegmen 45.0, largest width of tegmen 11.5, length of hind wing 50.0, length of hind femur 22.5.

Discussion: The new species resembles *R. fuscospinosa* (Brunner von Watteneyl) in coloration, stripes of pronotal disc, but differs from the latter by shape of tegminal spots and arrangement of veinlets of male stridulatory area, and structure of tenth abdominal tergum. *R. profunda* differs from *R. ensis* (De Haan) by the brown lateral stripes on pronotum and the male subgenital plate being not deeply split.

Etymology: The name derives from the Latin word "profund," which indicated that the male tenth abdominal tergum is deeply split into two lobes.

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